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ABSTRACT

A study assessed the impact of word processing on the writing of junior high school students, experienced in working with computers, for a number of tasks, including writing. Subjects, 111 eighth grade students in four communications arts classes at a Canadian middle-class suburban school, who had been using computers for writing for a year and a half, wrote one story on the computer and one story off the computer. The order in which the two writing tasks were presented and whether the subjects wrote first on or off the computer were different for each class to control for potential order effects with these two factors. Drafts and final versions of the students' writing were scored using a holistic/analytic instrument. Results indicated that: (1) the computer-written work was significantly better in overall quality and better on the competency and mechanics subscales of the evaluation instrument; (2) students produced significantly longer pieces of writing on the computer than off; (3) students reported very positive attitudes toward computer-based editing and writing; (4) there were no macrostructural differences in writing across media; and (5) only one surface feature, spelling, was found to be significantly better in the computer-written work. (Five figures and five tables of data are included; 51 references, the attitude questionnaire, a summary of the scale for evaluating narrative writing, verbal directions for teachers, sample student essays, and four tables of data are attached.) (RS)

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On and Off Computer Writing of Eighth Grade Students Experienced in Word Processing

Ronald D. Owston
Sharon Murphy
Herbert H. Wideman

Technical Report 90-1
May, 1990

Centre for the Study of Computers in Education
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Preface

A year before this study began a large number of computers were integrated into the grade 7 and 8 communications arts and social studies curriculum at the research site. At the end of that year teachers reported that:

(1) students had become much more motivated toward their work when using computers

(2) discipline problems--which were few to begin with--had become almost non-existent

(3) their teaching style shifted to being more child centred and individualized when teaching with computers

(4) students were writing longer papers in communications arts.

There was some debate among the teachers, however, about whether the students were producing better quality writing on the computer than they were by hand. The present study was designed to address this latter issue. The motivation to carry out the study came from the school's principal and teaching staff as well as from the Halton School Board's supervisory officers, all of whom wanted to see the issue of the quality of on and off computer writing addressed.

To all of the Halton staff and students, the authors are indebted for their enthusiastic cooperation and support of the project. The authors would also like to thank the York University Faculty of Education Research Fund for financial support of the project and to the Apple Canada Education Foundation for providing the computer hardware to make this study possible. The opinions expressed in this report are solely those of the authors and do not necessarily reflect the opinions of any of the participants or sponsors of this study.

Introduction

Educators and researchers, in their search for ways to foster the development of students' writing abilities, have begun to investigate the possible benefits of having students make use of a computer as a writing tool. Several arguments have been made in support of the use of word processing in the composing process. It has been suggested that by eliminating the drudgery of recopying a composition, and by allowing for far easier text modification, text editors can decrease student resistance to revising and encourage a more fluid and recursive writing style (Collier, 1983; Dickenson, 1986; Hooper, 1987; MacArthur, 1988). The potential impact of word processing on revision strategies could have educational significance, since extensive revision has been shown to be one of the most important components of the writing process, and the one that perhaps most clearly distinguishes novice from expert writers (Daiute, 1986; Etchison, 1985; Fitzgerald, 1987; Gerlach, 1987; Hawisher, 1987). Research on revision has shown that experienced writers revise extensively at the sentence and paragraph level, and that their revisions focus primarily on the substance, form, and shape of their argument. Students, by contrast, employ revision chiefly to correct perceived errors in syntax or failures to conform to conventional, teacher-dictated rules of form. Revision at a deeper level involving textual reordering or addition is rarely carried out (Bereiter & Scardamalia, 1987; Sommers, 1980). While the amount of revision shows a direct relationship to text quality only for older students, it is likely due that this is due to the lack of substantive revision on the part of younger pupils (Fitzgerald, 1987).

Observations and interviews with students have indicated that the effort of rewriting may be a serious impediment to revising (Daiute, 1986). By facilitating the mechanics of revision, the use of a word processor may lead the student writer to work in a less constrained, more experimental fashion, risking new modes of expression in the knowledge that any text can be easily changed (Collier, 1983).

Other features of computer-based writing have been proposed as being conducive to improving the quality of students' work. The public nature of the screen display may prompt students to read each others' work and so promote more peer review and editing (Dickenson, 1986; MacArthur, 1988). Screen displays also seem to facilitate student writers' development of a sense of their audience, perhaps by distancing the creator from his or her work (Hooper, 1987). On-going work is made more accessible to the teacher, and this may promote student-teacher conferencing in the critical drafting process (Morocco & Newman, 1986).

Parallel benefits have been attributed to the computer's ability to instantly print highly legible drafts. A student may derive far greater pleasure in seeing her work on paper and may be more likely to share it with others when it is neatly printed rather than illegibly handwritten. Students' ability to produce reports, newsletters, and "books" with a polished look for a real audience could promote a perception of writing as a meaningful form of communication which has a real personal value, as something in which the student can take pride (Bruce, Michaels, & Watson-Gegeo, 1985; MacArthur, 1988).

A great deal of anecdotal reportage exists to support the contention that word processing can have a positive impact on the quantity and quality of students' writing and revision (Bernhardt, Wojahn, & Edwards, 1988; Collier, 1983; Engberg, 1983; Fisher, 1983; Rodrigues, 1985). However, the findings of the relatively few empirical studies that have made some assessment of the quality of student revisions and final papers written on the computer are more ambiguous. The majority of the well-controlled, large-scale investigations that have been done have used college freshmen (usually composition students) as subjects. Etchison, using a pre-post design, studied the revisions and writing quality of 200 composition students, half of whom used word processors in their course sections and for post-tests (Etchison, 1985). Draft and final copies of explanatory and persuasive essays were collected at the beginning and end of the course. No significant differences between the experimental and control groups were found on 18 syntactical measures, but students using word processing had an approximately 500% greater gain in word length and number of T-units in their essays over the course, along with a 25% gain in average essay quality as compared to a 5% gain for the paper and pen group. A similar design was employed by Bernhardt and his colleagues in their investigation of writing improvement in 24 freshman composition classes (Bernhardt et al., 1988). As part of their study, pre- and post-test papers were rated on four dimensions: holistic (overall quality), organization, support, and fluency. Computer users revised and improved their post-test essays, especially the discourse-level features tapped by the holistic, organizational, and support scores, at levels significantly better than did those writing by hand. In addition, those students in the experimental sections who chose to compose their final papers on the computer (this was optional for the experimental group) performed significantly better than those in the experimental group who preferred to compose using paper and pen. However the main effect for treatment was not as large as that for teacher, suggesting that the quality of instruction was more important than the medium of writing.

Other research suggests that experience with word processing can produce benefits in later revision work even when that work is undertaken by pen. In a study by Cohen, freshmen in the experimental group performed about one third more revisions than did control group students even

though both groups wrote their post-test essays by hand (Cohen, 1986). Significant improvements in writing quality were also found in an experimental study of word processing by 102 basic writers in college developmental English classes (McAllister & Louth, 1988). The treatment effects were very modest however, with experimental group showing only a 7% greater improvement in essay quality. More substantive differences were observed in another writing experiment which used 60 freshmen as subjects. Based on an analysis of the revisions between drafts of several pairs rated over the school year, it was concluded that the word processing students had both higher amounts and a higher quality of revision.

While the majority of the studies of college-level word processing would seem to support its efficacy, there are a few dissenting voices. In a preliminary study, Harris examined the revisions made to four papers by six students from two university English and composition courses who varied widely in ability (Harris, 1985). Those who wrote on computer made fewer changes in the macrostructure of their essays; they did, however, make numerous changes in the surface features such as substitutions, word deletions and adding details.

Using Faigley and Witte's classification scheme and Diedrich's analytical scale, Hawisher looked at the revisions made to four essays by 20 college freshmen (Hawisher, 1987). No differences in the types of revisions were found across word processing and control groups, and in fact more between-draft revisions were made by the control group writers. Nor was there any evidence that the computer users revised more effectively; no differences in level of improvement from draft to final were found. Neither overall quality or improvement from draft to final paper correlated with the amount of revision, which might suggest that the revisions being undertaken were of little value. Hawisher suggested that editing during the composition process was found to be easier on the computer and so revising occurred immediately and was not so dependent on between draft revision. It is also possible that because all of her students had had experience with word processing, skills developed at that time could have been carried over into work on the handwritten essays, diluting the assessment of the true effect of the technology on writing.

A predominance of surface level revision has also been found in two other small-scale studies of word processing by college freshmen (Collier, 1983; Gerrard, 1982). Collier found that the use of the word processor did not promote any increase in idea, cluster, or paragraph revisions, nor did the writing quality improve. While Collier was only working with four students, Gerrard obtained similar results with a group of 44 freshmen, although he made no attempt to assess writing quality.

Fewer studies have been undertaken using younger students as subjects, and the results of these are more equivocal. In the most extensive work reported to date, Daiute has examined the revision

processes and writing quality of 57 grade 7 and 9 students, all of whom had extensive word processing experience (Daiute, 1986). Three writing samples, each in both draft and revision form, were collected at nine week intervals. The writing assignments were parallel in type. Only the middle assignment was done on the computer. Measures of text production, errors in mechanics and syntax, and holistic quality ratings were employed. Draft and final paper T-units were compared using the Faigley and Witte classification taxonomy. It was found that even after having completed one session of word processing per week for six months, students wrote more of their drafts within a 15 minute period when writing by hand than they did when using word processing. There were no more global revisions made when stories were typed on the word processor; indeed, more revisions were undertaken when the papers were written by hand. Final copies were longer when created on the computer, largely because students merely added unrelated material to the end of their work. Final computer-created essays were rated slightly higher in quality, which Daiute feels may be an artifact of their greater length. An earlier small-scale study by Daiute using eight junior high students found that those composing on the computer made more revisions and more different types of revision, but the revised computer essays did not receive quality ratings any higher than their handwritten counterparts (Daiute, 1984).

The results of an observational study in which four fourth-grade classes used word processing throughout the year indicate that student difficulties with the operation of the software and hardware can reduce the amount of student writing time and distract them from their real task (Dalton, Morocco, & Neale, 1988). Problems with the file-management skills of saving and loading programs and stories remained high throughout the year, and students had great difficulty with the more advanced text editing features such as block movement and even cursor placement. Students experienced a great deal of frustration, and much teacher time was diverted from teaching writing skills to dealing with these operational concerns.

Student use of primitive editing techniques due to a failure to master advanced editing features has been reported in several investigations of the use of word processing with younger children. Larter, in an experimental study of 98 grade one, three, and six classes, discovered that pupils at all levels relied on very basic editing techniques—usually character by character deletion using the backspace key (Larter, 1987). Even cursor movement was rarely employed. Despite these editing limitations, however, grade one and three papers written on the computer were rated as being of higher quality in terms of their ideas, organization, syntax, and spelling. Only surface-level features of word choice, syntax, and spelling were rated significantly higher in the grade six computer-written papers.

Even in those studies in which word processing has been found to have no significant effect, student reports are almost invariably positive about most aspects of the word processing experience. Despite some frustrations, they enjoy writing on the computer and remark on the ease of editing it permits and the satisfaction they get in being able to obtain neatly printed stories (Dickenson, 1986; Hooper, 1987; Larter, 1987). Kurth, who examined the work of a class of grade 10 and 11 students taking a composition course, found no difference in either essay length or amount of revision activity between the word processing and control groups. Nonetheless, the students who used word processing reported feeling more positive about their writing instruction and their ability to write, and found more value in their peer group editing work. Observational data indicated that the experimental students engaged in much more informal peer discussion and peer editing activity. Easy access to others' work on the monitor and in neatly printed copy seemed to foster task-relevant interaction, and the display of students' efforts on the screen kept them focussed more closely on their task.

Other researchers have also noted both the motivational value of word processing and its ability to promote the kinds of peer editing and interaction considered central to the process writing approach (Dickenson, 1986; Kurth, 1987; MacArthur, 1988).

To date, there is clearly more evidence supporting the use of word processing in composition at the college level than there is for its use in the pre-college years. Several factors may have contributed to the generally negative findings regarding revision and work quality in studies with younger students. It may be unreasonable to expect that providing children with a word processor will by and of itself result in an improvement in their writing (Blaljthy, McKeveny, & Lacitignola, 1986-87; Hooper, 1987; MacArthur, 1988). Word processing by itself may encourage surface revision at the expense of macrostructural change (Hult, 1986). Students may need to be fluent in the mechanics of using the software so that overwhelming demands are not made on students' cognitive capacities which might inhibit effective use of the word processor by diverting attention away from the substance of writing. Sound writing instruction may also be necessary to develop in students the compositional strategies that can take advantage of the computer's capabilities (Hooper, 1987; MacArthur, 1988). Certain features intrinsic to word processing, such as the inability of the writer to see the entire composition on the screen at one time, and the lack of necessity to recopy (and thus reread) drafts, may discourage deeper level revisions of content and structure (Dickenson, 1986; Hawisher, 1986; Hawisher, 1987; Hult, 1986; Kurth, 1987; MacArthur, 1988). When both groups in an experimental study do receive extensive training in process writing methodologies the effects of this training may overwhelm the more modest impact of word processing on the revision process, and so no significant differences may be found.

Still, the paucity of data relating to school-aged children's use of word processing makes any conclusions about its overall value premature. Most of the studies at the pre-college level have been non-experimental and have used low numbers of subjects, making generalization risky. Nor is it always clear in the published reports how much familiarity and skill the students had in keyboarding and using the software (Tone & Winchester, 1988).

The present study has been designed to provide a relatively large-scale experimental assessment of the impact of word processing on the writing of junior school students highly experienced in working with computers for a number of tasks, including writing. Writing samples from four classes of students working both on and off the computer were collected in order to determine if word processing provided any benefits above and beyond those that might have transferred to paper and pencil writing as a result of previous exposure to text editing. All draft and final papers were rated for overall quality using a holistic/analytic scale, and a subsample received a further, more detailed analysis of their surface features and textual coherence, in order to permit a more specific comparison of the characteristics of subjects' on and off computer writing.

Method

Subjects

One hundred and eleven grade 8 students in four communications arts (CA) classes at a middle-class suburban school participated in the study. The school was designated a centre for innovation by a major computer company educational foundation the year before the study began. As such, the school experienced a large influx of computers which brought the student/computer ratio to approximately 12 to 1. The school's goal was to integrate the computers across the curriculum beginning immediately with grades 7 and 8 social studies and CA, and then integrate them into other subject areas and lower grade levels as more hardware was obtained from the foundation.

At the beginning of the study subjects had been using computers for the writing component of their CA classes for a year and a half. Throughout this period subjects spent four 40 minute periods in a six day cycle in the computer room which contained one Apple IIGS computer (with Appleworks software) for each student. While some direct instruction did occur in the computer room, most of the subjects' time there was spent either writing or discussing their writing with peers or the teacher. By the time the study began subjects had made the transition from writing drafts out by hand and then copying them into the computer to composing and editing directly on the computer. All subjects had had regular practice in typing using a typing tutorial program and, while most were not proficient at touch typing, each had achieved a certain degree of comfort with keyboarding.

Procedure

Subjects were asked to write one story on the computer and another story off the computer. The two teachers, who were each teaching two CA classes, suggested that the yarn would be a suitable genre for the story since it would allow for creativity and would sustain student interest. In collaboration with the teachers, we developed two writing tasks. The first was to "write about an act of great strength" (Task A), the second was to "write about an act of great courage" (Task B). The tasks were pretested on students in another grade 8 class in the school that was not part of the study. From this pretesting the task administration protocols were refined. The student papers also provided us with sufficient evidence to judge that the tasks were sufficiently similar to be considered equivalent.

The order in which the writing tasks A and B were presented to the subjects and whether subjects wrote first on or off the computer was different for each class so as to control for potential order effects with these two factors. Figure 1 illustrates the order each class followed.

Class	First Writing Session	Second Writing Session
8-1	On computer, form A	Off computer, form B
8-2	On computer, form B	Off computer, form A
8-3	Off computer, form A	On computer, form B
8-4	Off computer, form B	On computer, form A

Figure 1 Writing sequence and test form for each class

The writing tasks were integrated into the regularly scheduled CA classes. Before the subjects began each writing task, their CA teacher prepared them by reading aloud a sample yarn as they followed along on their own printed copy. The teacher then discussed the characteristics of the genre with the subjects and assigned the task after there were no more questions. Subjects were given one double period (80 minutes total) to write a draft paper and the same amount of time during the next double period to produce a final version. This procedure was followed for both on and off computer writing tasks. Students were encouraged to discuss their work with their writing partners (as was normally done during their writing classes) and they were permitted to use spellcheckers when writing on computer or dictionaries when writing off computer. Both draft and final papers were collected; thus for each subject there were four papers at the end of the study, a draft and final prepared on the computer and a draft and final prepared off the computer.

A modified version of the Fitch Attitude Toward Writing Scale (Fitch, 1985) was administered to all students at the beginning of the study. This scale has two components: one is concerned with editing (e.g. "I don't mind adding words or sentences into a paragraph"); the other deals with writing in general (e.g. "I find writing frustrating...enjoyable"). Students were asked to respond to the scale about their attitudes to both on and off computer writing . The modified version of the scale is shown in Appendix A.

Scoring of Writing

For scoring purposes, the subjects' handwritten work was transcribed into computer files and these files together with the subjects' computer written work were printed using the same type style so that a reader could not tell by surface features whether a paper was written on or off computer. Names and other identification marks were also removed from the paper and a random coding number was placed on them so that the researchers could identify them later.

The researchers trained four teachers—the two CA teachers and two from outside of the school—to score the papers using an adaptation of the Scale for Evaluating Narrative Writing (Quellmalz, 1982). This holistic/analytic instrument uses six-point scales for assessing four characteristics of writing: overall competence, focus/organization, support of ideas, and mechanics. These characteristics are defined in Figure 2. A description of the scale levels is given in Appendix B. The training consisted first of having the teachers study the scale definitions and discuss any questions they had about them with the researchers. Then the teachers began scoring practice using the pretest papers and discussing their ratings with the researchers' ratings of the same papers. Training continued until all teachers reached consensus on all four scales. During the actual scoring, which lasted one day, the researchers were present to monitor their scores and to answer any questions.

Scale	Definition:
General competence	The overall, or holistic, impression of a piece of writing as to how clearly it communicates a message to the reader.
Focus/organization	The extent to which the topic is clearly indicated and developed in an organized manner.
Support	The quality (specificity and amount) of the support provided for the paper's theme both within each paragraph and throughout the paper.
Grammar/mechanics	The extent to which errors interfere with the writer's effectiveness in communicating.

Figure 2 Definitions of subscales of the Scale for Evaluating Narrative Writing

Subsample Analysis

From the larger sample, a subsample of the writing of thirty students, gathered under all conditions, was randomly selected for detailed analysis. For each student in the subsample, the draft and final pieces done both on and off the computer (120 pieces of writing) were subject to an analysis of their surface features and textual coherence. The surface features analyzed were syntactic complexity as measured by words per t-unit and clauses per t-unit, use of paragraphing, use of punctuation, and spelling. Textual cohesion was examined by means of cohesive harmony analysis (Hasan, 1984). These features were selected because of the possibility that they would be sources of variability, especially in revision. All detailed analyses were conducted by a researcher trained in the procedures and blind to the status of the pieces of writing (i.e. draft/final, on/off computer).

Syntactic Complexity

The unit of analysis for coding syntactic complexity is usually the sentence. However, in analyzing the writing of developing writers, punctuation and capitalization errors, along with the use of run-on sentences, make it difficult to delimit sentence boundaries. In addition, because personal choice, rather than use in an obligatory context, governs some punctuation decisions (e.g. use of "and" to join two independent clauses; use of semicolons (Quirk, Greenbaum, Leech, & Svartik, 1972), the organization of text into sentences is not subject to rules alone. Consequently, the t-unit (Hunt, 1965), which avoids these problems, was used as an indicator of syntactic complexity in the present study. A t-unit is "one main clause with all the subordinate clauses attached to it" (Hunt, 1965, p. 20).

Each text was classified into t-units. Each t-unit was divided into independent and subordinate clauses in accordance with Quirk and Greenbaum's (1973) grammar. For each text, the mean number of words per t-unit (WPT) and the average number of clauses per t-unit (CPT) were calculated. Means were used to avoid the confounding effects of length.

Paragraphing Format

A count of the number of paragraphs per text under each condition was conducted. To control for length, the number of paragraphs per hundred words (PPHW) was calculated for each of the texts under each of the conditions. The PPHW was calculated in order to determine whether students were formatting their texts into paragraphs more under one condition than the other.

Use of Punctuation

The number of punctuation marks for each text was calculated. Both incorrect and correct marks were counted in order to determine whether the treatment condition affected the frequency of use. A second count of the number of incorrect punctuation marks was also made. Punctuation marks were counted as incorrect if they violated a punctuation convention as specified in Quirk, Greenbaum, Leech, and Svartik (1972). If a punctuation mark was used in a context that was a matter of choice and not obligation, it was designated as correct. To eliminate the confounding effects of length, the average number of punctuation marks per t-unit (PTU) was calculated. In addition, the total number of incorrect punctuation marks per text was converted to a percentage of the total number of punctuation marks (%INC) to control for the influence of length of text.

Spelling

Number of errors. Each text was read on a minimum of two occasions for the purposes of identifying spelling errors in the draft and final pieces under each of the conditions. The number of errors per text was converted to a percentage of the total number of words per text to correct for differences due to text length. Comparisons were made of the percentage of spelling errors under each of the conditions.

Revisions. To investigate further the nature of spelling patterns among conditions, the revisions or changes from draft to final were coded under the following categories:

Corrected:	a word misspelled in the draft was corrected in the final
Not Corrected:	a word misspelled in the draft was not corrected in the final
Unsuccessful Correction:	an attempt to correct a word misspelled in the draft resulted in a new misspelling of that word in the final
Abandons Correct Form:	correct spelling was used in the draft but word was misspelled in the final
Omission:	word misspelled in the draft was omitted from final either through substituting another word or omitting entirely
New:	a word not used in the draft was used in the final and was misspelled.

The categories of Correct, Not Correct, Unsuccessful Correction and Omission were calculated as a proportion of the misspellings that had occurred in the draft. The category of Abandons the Correct

Form was calculated as a proportion of the words spelled correctly in the draft. The category of New was calculated as a proportion of the misspellings that had occurred in the final.

Types of misspellings. In addition to examining the general categories of revision in spelling, a further analysis of the types of misspellings under each condition was conducted. To code the spelling, the category system of Wilde (1989) was used. In that system each spelling word is categorized in terms of a list of features which represent the degree of orthographic convention of the misspelled word either in relation to the correct word or to English-language words in general. This additional analysis was conducted to determine whether the nature of the graphic display might have impacted upon the types of errors that were left remaining in draft and final texts under each condition.

Wilde's category system is presented below.

unusual spellings: usually start with the appropriate initial letter, similar in length to the intended word, include many of consonants in the intended word but sequence is off and vowels may differ (e.g. "baraque" for "barbecue", "scence" for "since")

non-conventional consonants: consonants are not spelled with the same convention as the intended word (e.g. "aginsty" for "agency", "thow" for "though")

non-conventional vowels: vowels are not spelled with the same convention as the intended word (e.g. "servivers" for "survivors", "burgaler" for "burglar")

non-conventional suffixes: conventions relating to adding of suffixes are not followed and result in misspellings at or around the root word/suffix juncture (e.g. "mustanges" for "mustangs", "payed" for "paid")

permutation: misspelling has all the letters of the intended word but they are in the wrong order (e.g. "forgein" for "foreign")

differs by single letter: misspelling differs from the intended word by the addition, omission or incorrect substitution of a single letter (e.g. "mibble" for "nibble", "finnally" for "finally", "sacer" for "saucer")

real word: misspelling is a real word (e.g. "say" for "saw", "there" for "their")

punctuation: apostrophes are inserted or omitted; word boundaries of the misspelling differ from those of the intended word (e.g. "dont" for "don't", "him self" for "himself")

For the purposes of this study, the "punctuation" category reflected only punctuation misspellings. An additional category of "spacing" was added exclusively for word boundaries. Word boundaries were categorized separately under the assumption that this category might reflect "space bar typos"

made by students while working on computers (e.g. "Ithink" for "I think"). Each word coded using Wilde's system was coded on only one category — the highest category into which it would fit. The proportion of errors within each category for each of the conditions was calculated.

Textual cohesion

An analysis of textual cohesion using the category system of Halliday and Hasan (1976) was considered as one means by which to portray the students' written texts as "semantic units". Because, according to Hasan (1984), the analysis of cohesive ties provides an index of cohesion but not of textual coherence, the analytical system referred to as cohesive harmony analysis was considered preferable for the coding of each of the texts in the subsample.In cohesive harmony analysis, the lexical and grammatical links throughout a text are traced. Each link forms a chain of meaning which holds the text together and allows paths of continuous interpretation. Chains may be of two types: identity chains or similarity chains. The binding element in identity chains is co-referentiality. The same semantic identity is traced through text (e.g. "boy and girl" = "their", "Jack" = "Jack", "Jack" = "boy", or "Jack" = "student"). Similarity chains are not as bound to text as identity chains. In similarity chains, substitution or ellipsis may form the basis of the link between parts of the text. Once the chains have been described, the next step involved is to trace the co-occurrence of two or more different lexical or grammatical chain elements throughout the text. If "two or more members of a chain stand in the same functional relation vis a vis two or more members of some one specific chain", then an interaction between chains is deemed to have occurred (Hasan, 1984, p. 214). The cohesive harmony score is the number of Central Tokens (interactions) divided by the number of Total Tokens (all elements which participate in interactions plus the elements which do not). The higher the cohesive harmony score, the greater the coherence of text.

Results

Writing achievement

The data were first analyzed using a multivariate repeated measures design. The dependent variables were computer competence, focus, support, and mechanics. There were three between subjects variables: sex (male, female), order (writing on computer first, writing off computer first), and version of model yarn seen first. The within subjects factor was situation (on or off computer).

Mean scores for the final versions of papers on all four writing scales are shown in Figure 3. None of the between subjects effects were found to be significant ($p>.05$), however, significant within subjects effects were found. Subjects scored significantly higher writing on the computer than they did writing off computer ($F(4,68) = 3.73$, $p=.008$). Follow up univariate tests of significance revealed that on computer writing scored significantly higher for competence ($t=2.15$, $p=.036$) and mechanics ($t=3.17$, $p=.002$). A significant interaction was found between final competence and sex ($t=-2.08$, $p=.04$) with females scoring higher than males. Figure 4 illustrates the mean scores for males and females for final versions of papers. No other univariate interaction effects were found significant ($p<.05$).

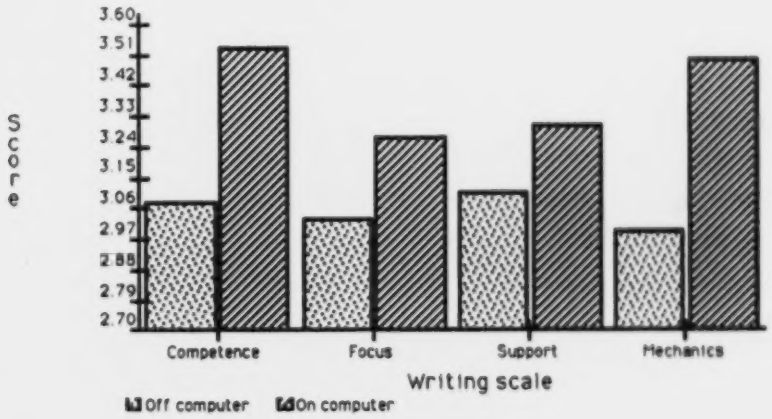

Figure 3 Mean scores for on and off computer writing

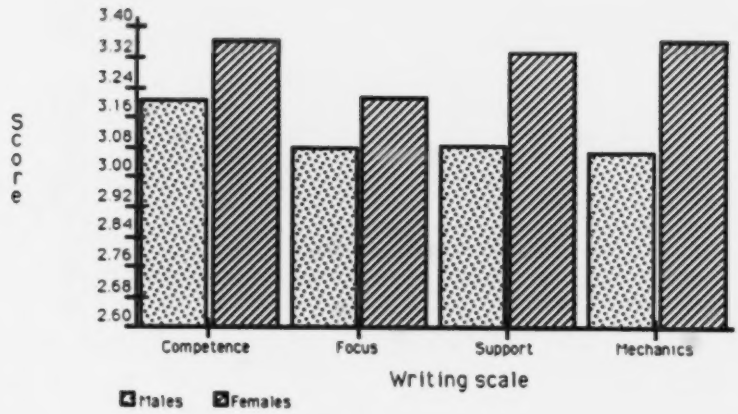

Figure 4 Mean writing scores for males and females

The analysis was repeated, this time using draft scores on competence, focus, support, and mechanics as covariates to test whether improvements were made between the draft and final versions of the paper. As expected, the analysis indicated a significant main effect for version of paper ($F(4,59) = 4.81$, $p=.002$) with final papers being rated higher than drafts. This finding, which is shown in Figure 5, illustrates that students did revise their papers between draft and final stages of their writing. In addition, the univariate tests were significant on all four variables: competence ($t=2.44$, $p=.02$), focus ($t=2.63$, $p=.01$), support ($t=3.87$, $p=.0003$), and mechanics ($t=3.47$, $p=.001$). The difference between on and off computer writing was not significant ($F(4,59) = 2.37$, $p=.063$) indicating that improvement occurred between draft and final stages regardless of whether subjects were writing on or off computer.

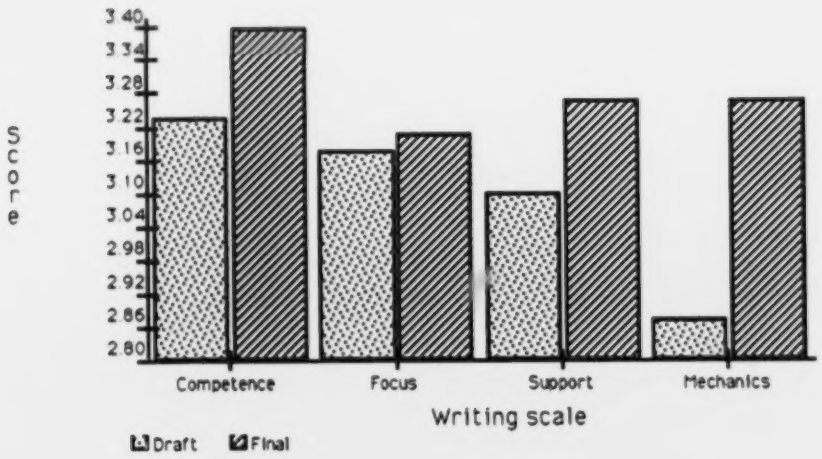

Figure 5 Mean writing scores for draft and final versions of papers

Length of Papers

Word counts were obtained using the word processing program WordPerfect. Final versions of papers written on computer were found to be significantly longer than those written off computer when lengths were compared using the Wilcoxon matched pairs signed-ranks test ($z= 2.56$, $p=.01$). Mean lengths and standard deviations of on and off computer drafts and final papers are given in Table 1.

Table 1

Lengths of draft and final papers on and off computer (in words)

	On computer		Off computer	
Version	Mean	SD	Mean	SD
draft	245	110	235	127
final	273	111	242	130

Attitudes toward writing

The anecdotal reports of teachers at the site indicating that students had more positive attitudes toward writing when working on computers were confirmed by this study. Means and standard deviations of student responses to the Fitch Attitude Toward Writing Scale are given in Table 2.

Both general attitude toward writing and attitude toward editing were found to be significantly more positive when students worked on the computer compared to when they worked off computer.

Table 2

Attitudes toward writing on and off computer

	Condition			
	On computer		Off computer	
Attitude	Mean	SD	Mean	SD
editing	3.13	.41	2.41	.44
general	3.37	.47	2.40	.66

Subsample analysis

The subsample data for words per t-unit (WPT), clauses per t-unit (CPT), paragraphs per hundred words (PPHW), punctuation per t-unit (PTU), mean percent incorrect punctuation (%INC), mean number of spelling errors per text, and cohesive harmony were analyzed using repeated measures analysis of variance designs (see Appendix F for tables presenting mean scores). Regardless of condition, subjects were found to include more paragraphing in their final papers as compared with their drafts ($F(1,29) = 4.44$, $p = .044$); however, the use or non-use of computers did not seem to significantly affect the formatting of texts into paragraphs. No other significant effects were observed except in one area For mean number of spelling errors per text, the analysis of variance revealed significant main effects for the draft/final condition ($F(1,29)=11.55$, $p.=.002$) and for the on/off computer condition ($F(1,29)=17.88$, $p<.001$). An examination of the means, as illustrated in Table 3, indicates that students made on average fewer spelling errors in their final text. In

addition students made fewer spelling errors on average when writing on computers. Interaction effects were not significant.

Table 3

Mean proportions of spelling errors

	Condition	
Paper version	On computer	Off computer
Draft	.025	.042
Final	.018	.032

The data on types of spelling revisions was analyzed using a multivariate repeated measures design. A significant difference between on and off computer revision behaviour in spelling was observed ($F(6,24) = 5.28, p = .001$). Although follow-up univariate tests of significance could not be used because the data did not meet all of the requirements for symmetry, a comparison of means between the on and off computer spelling revisions suggests that there are some distinct patterns. As illustrated in Table 4, it appears that while students engage in approximately the same amount of correcting behaviour and make approximately the same proportion of unsuccessful attempts at correction, their revising behaviour appears to differ in all other respects when writing on as opposed to off the computer.

Table 4

Mean Proportion of spelling revisions

	Condition	
Revision category	On Computer	Off Computer
Correct	.245	.257
Unsuccessful correction	.038	.044
Not correct	.630	.365
Omissions	.056	.227
Abandons correct form	.00035	.005
New	.115	.422

When the spelling data were analyzed to determine whether there were any patterns in the types of misspellings, the misspellings clustered into two dominant categories regardless of condition. As illustrated in Table 5, seventy percent or more of student misspellings either differed from the correct form by a single letter or fell into the category of "real word".

Table 5

Types of misspellings as a percent of total misspellings per condition

	Draft version		Final version	
Misspelling type	On Computer	Off Computer	On Computer	Off Computer
Unusual	1.03	2.38	2.31	0.50
Consonants	4.10	9.13	3.08	5.56
Vowels	3.08	3.17	2.31	3.54
Suffix	4.10	3.17	1.54	5.56
Permutation	0.00	1.59	0.00	0.00
Single letter	37.44	46.43	20.77	53.03
Real word	37.44	23.41	57.69	24.24
Punctuation	9.23	8.33	10.77	6.06
Spacing	3.59	2.38	1.54	1.52

Discussion

This study found that when eighth grade students were given two similar writing tasks — one on the computer, the other off the computer — they produced better quality work on the computer as judged by trained raters. In particular, the work received significantly higher ratings in overall competency and in mechanics. Three possible explanations for these observed differences seem readily apparent: (1) the observed differences may be an artifact of the superior spelling of the computer written work, (2) the students' high level of motivation may have led to greater attention being given to their computer writing, or (3) experience and familiarity with the word processor may have allowed the students to more easily edit and revise their work , thus improving its overall quality. Each of these explanations is discussed below.

Spelling

An in-depth analysis of the subsample data revealed a possible explanation for the observed differences between on and off computer writing. This analysis is, to some extent, supportive of the research of Larter (1987) and Daiute (1986) for this age group and similar to the outcomes of studies at the college level (Harris, 1985; Collier, 1983; Gerard, 1982). Specifically, when draft and final versions of texts written on and off computers were compared, no significant differences were found in the types of macrostructure elements present across writing media. Unlike the research noted above, significant differences were also absent for most surface feature changes (such as punctuation, paragraphing, syntactic complexity as measured by words per t-unit) with one exception — spelling. Not only did students make fewer spelling errors on average when they were using computers but they seemed to make different types of errors.

The absence of significant differences in the sample analysis between the on and off computer texts (for all elements but spelling) may appear at odds with the outcomes from the holistic ratings of stories. However, the explanation for this pattern, also found by Daiute (1986), may lie in the analysis of the spelling data.

First of all, even though spelling is categorized as a surface feature in studies of writing, when considered from the perspective of the reader who is rating a selection, spelling goes beyond

surface features into lexical, sentential and textual meaning. Depending on the degree of contextual support that the syntax and semantics of a text give a particular lexical item that has been misspelled, it seems logical to hypothesize that a misspelling (1) may not even be recognized as such (as is often the case with typos); (2) may be recognized as a misspelling; or (3) it may cause a barrier to meaning. If a misspelling is detected and is an impediment to meaning, then the particular misspelling can have an impact on how the text is rated on areas other than surface features. Given the finding, in both the present study and that of Daiute (1986), that students have fewer spelling errors when writing on computers as compared with writing off computers, there was less likelihood of the raters encountering textual ambiguities arising from misspellings in on-computer writing. The on-computer work might have been rated as slightly better in quality as a consequence.

The analysis of spelling revision data provides some insights into how the computer facilitates correctness in spelling. A number of distinct patterns can be seen in the data. When students attempt to deal with their misspellings, they make approximately the same proportion of corrections and the same proportion of unsuccessful attempts at correction regardless of whether they are writing on or off the computer. However, beyond these two categories, there are differences. When writing off the computer, students tend to omit in their final text words they had spelled incorrectly on their drafts, abandon in their final texts a higher proportion of words they had spelled correctly in their drafts, and make proportionally more new errors in their final papers. Even though students make fewer errors when writing on computers, students seem to leave a higher percentage of their errors uncorrected. This seems unusual given the ease of correction under the computer condition.

The analysis of the types of spelling errors made under each condition offers some indications as to why students, when writing on computers, do not appear to have corrected their misspellings. As illustrated in Table 4, most spelling errors differed only by a single letter from the correct form (e.g. "lense" for "lens" or "berrings" for "bearings") or were real words in and of themselves (e.g. "if" for "of" or "their" for "there"). The one interesting pattern of note is that students writing off the computer included proportionally more misspellings that differed by one letter and were not real words than they did when writing on the computer. In addition, it appears that when writing on the computer, the misspellings were more likely to be real words. This pattern could suggest that computer generated text may make it easier to detect non-words; however, when the misspellings are real words (often differing from the correct form by a single letter), the computer shows no advantage. Because persons writing on computers will reread rather than rewrite, real word misspellings may be less obvious.

In addition to the above explanations, several other factors must be considered. First , in the in-depth analysis all measures controlled for the influence of length. Since computer-generated texts were significantly lengthier than handwritten ones, then, by definition, there was a greater likelihood that these texts would have more elements such as t-units, paragraphs, and spelling errors. It is not clear whether other researchers utilized mechanisms to control for the effects of lengthening. Consequently, differences in results may be accounted for by the use of the factoring out of length effects in the present study. Secondly, the analysis referred to above compared the draft version of a story to the final one. The process of revising itself was not observed. Consequently, the degree of computer-based spell-checking engaged in while writing or of off-computer dictionary use is unknown. Nevertheless, it seems plausible to suggest that when writing off computers, perhaps because of the nature of physically looking up a word in a dictionary as opposed to pulling up an easily-accessible computer spell-checker, students opt to omit the word rather than check it. It is also possible that the new misspellings that occur are, in part, a result of moving from using one misspelling to replace another. Finally, an alternate cause for abandoning the correct spelling may be student inattentiveness during the process of copying the edited draft into final form.

Attitudes

Teachers at the research site reported that since the large scale introduction of computers the previous year, students had consistently demonstrated very favourable attitudes toward any work that was assigned on the computer, including writing. Hawisher and Selfte (1989), in a review of a large number of studies of computer writing, also found that students typically exhibit positive attitudes toward writing on computers. The findings of this study confirm both the teachers' observations and those of the studies Hawisher and Selfe examined. What may be more revealing than the student's positive attitudes about writing on the computer, however, are the negative attitudes reported by students in this study about writing without the computer. The mean scores on both the attitude toward writing in general and toward revising scales were slightly less that the midpoint of the four point scale used. Many students reported that they "seldom" or "almost never" like to make such fundamental changes to their work as correcting errors after they are pointed out to them. Many students also felt that rewriting a paragraph is a waste of time. Thus, a reasonable hypothesis for the superior computer written work is that students are much more inclined to revise and edit their work on computers than they are hand written work.

Word processing experience

One of the most salient differences between the present study and others with school aged children is that the subjects in this study were experienced computer users. At the beginning of the study they had been using computers in CA for a year and a half for about three and one half hours per six day school cycle. Moreover, students had unrestricted access to their own computer during the classes. From the beginning students were encouraged to compose directly on the computer screen. Great variability in students' keyboard skills was observed over the writing sessions; however during informal observation the researchers did not witness any students whose writing was hindered by lack of these skills. Additionally, none of the kinds of operational problems such as managing files, loading disks, and working the hardware that were reported by Dalton, Morocco, & Neale (1988) were observed with these subjects. Freed from the vagaries of the technology, students were able to spend their time more using more productively the features of the word processor that facilitate writing. Taken together with students' positive attitudes toward revising and editing their work on computer, this could be seen as third plausible explanation of why subjects produced higher quality work on the computer than by hand.

Summary and Conclusions

In this study we examined the writing of four classes of experienced eighth grade students working both on and off computers. When the writing produced by students under these two conditions was compared, we found that the computer written work was significantly better in overall quality and better on the competency and mechanics subscales of the Scale for the Evaluation of Narrative Writing. Students also produced significantly longer pieces of writing on the computer and they reported very positive attitudes toward computer-based writing and editing. An analysis of draft and final versions of the on and off computer work revealed no macrostructual differences in writing across media and only one surface feature, spelling, was found to be significantly better in the computer written work.

Several plausible explanations for the observed differences between on and off computer writing were discussed: The superior spelling found in the computer written work may have influenced the ratings of the papers. Students' more positive attitudes toward their work led to the students making a greater effort to edit and revise when writing on computer. Finally, the students' experience and familiarity with the word processor, when taken together with the editing capabilities of the technology itself, made story creation, editing, and revising relatively easy for them, which may have encouraged a more intensive focus on the composition task. The wide range of these speculations highlights the need for research focusing upon the processes of writing as well as the products if we are to truly gain insight into the benefits of writing on computers.

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Appendix A

Attitude Questionnaire

Name_____ Class_____

This is designed to find out how you feel about writing with the computer and without the computer. Please answer the questions as truthfully and as completely as you can. You are not graded on this, and it in no way affects your class grade.

PART I

DIRECTIONS

Below are ten statements describing feelings about writing. For each statement, think about whether you agree "almost always", "frequently", "seldom", or "almost never" with the statement when you are writing on the computer. Then under the heading **ON COMPUTER** mark an "X" in the blank beside the answer that best describes how you feel.

Next think about how much you agree with the **same** statement when you are writing off the computer. Mark your answer under the heading **OFF COMPUTER**.

1. I like to write paragraphs.

ON COMPUTER	**OFF COMPUTER**
_____ almost always	_____ almost always
_____ frequently	_____ frequently
_____ seldom	_____ seldom

_____ almost never

_____ almost never

2. I don't like to try different ways of organizing my sentences or paragraphs.

ON COMPUTER

_____ almost always

_____ frequently

_____ seldom

_____ almost never

OFF COMPUTER

_____ almost always

_____ frequently

_____ seldom

_____ almost never

3. I like to make changes in my rough copy of a paragraph.

ON COMPUTER

_____ almost always

_____ frequently

_____ seldom

_____ almost never

OFF COMPUTER

_____ almost always

_____ frequently

_____ seldom

_____ almost never

4. I think rewriting a paragraph after making corrections is a waste of time.

ON COMPUTER	OFF COMPUTER
_____ almost always	_____ almost always
_____ frequently	_____ frequently
_____ seldom	_____ seldom
_____ almost never	_____ almost never

5. Once a spelling or punctuation error in a paper has been pointed out, it is easy to correct.

ON COMPUTER	OFF COMPUTER
_____ almost always	_____ almost always
_____ frequently	_____ frequently
_____ seldom	_____ seldom
_____ almost never	_____ almost never

6. After changes in sentence position have been pointed out to me, I still think changing the sentences around in a paragraph (moving sentences) is not worth the trouble.

ON COMPUTER	OFF COMPUTER
_____ almost always	_____ almost always
_____ frequently	_____ frequently
_____ seldom	_____ seldom

_____ almost never

_____ almost never

7. I don't mind adding (inserting) words or sentences into a paragraph.

ON COMPUTER

_____ almost always

_____ frequently

_____ seldom

_____ almost never

OFF COMPUTER

_____ almost always

_____ frequently

_____ seldom

_____ almost never

8. I don't like taking out (deleting words or sentences from a paragraph.

ON COMPUTER

_____ almost always

_____ frequently

_____ seldom

_____ almost never

OFF COMPUTER

_____ almost always

_____ frequently

_____ seldom

_____ almost never

9. I don't like to make the final copy of my paper.

ON COMPUTER	OFF COMPUTER
_____ almost always	_____ almost always
_____ frequently	_____ frequently
_____ seldom	_____ seldom
_____ almost never	_____ almost never

10. I like to show my written work to others.

ON COMPUTER	OFF COMPUTER
_____ almost always	_____ almost always
_____ frequently	_____ frequently
_____ seldom	_____ seldom
_____ almost never	_____ almost never

In the space below please write any comments you have about using the computer for writing.

_____

PART II

Following are some words and phrases which may describe **feelings about writing**. Please mark your "feeling position" ON (not between) one of the lines. For example:

love ____ __X__ ____ ____ hate

This "X" shows that this person loves writing more than he/she hates it. If the "X" were in the blank right next to "love", the person would love writing very much.

On the next page, first mark how you feel about writing on the computer and then mark how you feel about writing off the computer.

ON COMPUTER

frustrating	____	____	____	____	enjoyable
easy	____	____	____	____	difficult
a waste of time	____	____	____	____	time well spent
fun	____	____	____	____	work
a way I express myself	____	____	____	____	not a way I express myself
something I'd like to do less	____	____	____	____	something I'd like to do more
makes me nervous	____	____	____	____	helps me relax
sometimes important to do	____	____	____	____	rarely important to do
something I can be proud of	____	____	____	____	something I get rid of right away

OFF COMPUTER

frustrating	___	___	___	___	enjoyable
easy	___	___	___	___	difficult
a waste of time	___	___	___	___	time well spent
fun	___	___	___	___	work
a way I express myself	___	___	___	___	not a way I express myself
something I'd like to do less	___	___	___	___	something I'd like to do more
makes me nervous	___	___	___	___	helps me relax
sometimes					rarely
important to do	___	___	___	___	important to do
something I can be proud of	___	___	___	___	something I get rid of right away

Appendix B

Summary of the Scale for Evaluating Narrative Writing

General Competence

Level 6	Excellent example
Level 5	Good
Level 4	Adequate
Level 3	Developing
Level 2	Rudimentary
Level 1	unfocused, poor

Focus/Organization

Level 6	subject clear, subject developed, events logical, no digressions, transitions
Level 5	slight digression, most transitions logical
Level 4	most events logical, some over or under elaboration, some digression, most transitions smooth
Level 3	subject clear, some unclear development, most events logical, some digression or excessive elaboration, some transitions not smooth or logical (and, so, but, then)
Level 2	main point not clear, some events not logical, no attempt to limit topic, few smooth transitions
Level 1	subject unclear, main point unclear, no clear organization plan, no attempt to limit topic

Support

Level 6	all events, characters, setting developed, in depth description, support more specific than general statements
Level 5	most developed by detail, some detail uneven, in one or two instances detail lacks depth
Level 4	some detail lacks depth
Level 3	uneven detail several statements lack detail, some support not specific, some support not relevant
Level 2	many details lack specificity, depth, relevance
Level 1	no support or vague, confusing, irrelevant support

Mechanics

Level 6	one or two minor errors, no gross errors
Level 5	a few minor errors, may be one gross, usage + mechanics still not a problem
Level 4	a few common errors, one or two gross + no more than three minor, total of 5 minor
Level 3	some errors interfere, some gross and minor
Level 2	many gross and minor, some detract from clarity of communication
Level 1	difficult to read, many gross varied

Appendix C

INTRODUCTION/VERBAL DIRECTIONS FOR FIRST SESSION

COMPUTER WRITING PROJECT

We've been doing a lot of work on different types of writing and different features of writing.

Today, we're going to do a special type of writing in which the **whole story** is an exaggeration.

The kind of writing I'm talking about is called a **yarn**.

When someone tells a yarn, at the beginning they seem to be telling you about something very ordinary.

But, pretty soon you begin to see that there is no truth in what they are saying because their story contains one exaggeration after another.

Here's a short example from **Paul Bunyan** stories which are good examples of yarns:

THIS SHOULD BE WRITTEN ON THE BOARD AHEAD OF TIME:

The bunkhouses where we slept were so cold that the words froze as soon as the men spoke. The frozen words were thrown in a pile behind the stove and the men would have to wait until the words thawed out before they knew what was being said.

This starts out like an ordinary story (sweep hand under first line) but after the first few words it becomes nothing but a series of exaggerations. Once the exaggeration starts it continues until everything comes back to normal in the last sentence. Then another exaggeration could occur.

(HAND OUT COPY OF YARN.) I've given you another example of a yarn. You can follow while I read along. (READ YARN ALOUD WITH LOTS OF EXPRESSION TO CONVEY EXAGGERATION.)

Now what I would like you to do is to write your own yarn. We'll do a draft today and you can revise your draft in our next double period. It should be a story and not a poem or song.

You can brainstorm for ideas with your partner.

Remember that if you have trouble with some of the words, you can use the (**checker/dictionary**) to help you.

Please remember to write your name on your draft and put (**it/a copy of it**) up here on my desk.

NOTE: If students ask for opinions on their writing, ask them to ask their partners. Refer them to dictionaries/checkers for spelling.

STUDENTS WHO FINISH EARLY MAY SELECT SOMETHING TO READ.

Form A

Sunrise in His Pocket

One January morning it was so cold that the forest trees were so stiff that they couldn't shake and the very day-break froze as fast as it was trying to dawn. Seeing that daylight was so far behind time, I thought all of creation was freezing for good.

"So," I thought, "I must strike a little fire from my fingers, light my pipe, travel out a few leagues, and see about it."

Then I brought my knuckles together like two thunder clouds, but the sparks froze up before I could begin to collect them - so out I walked and endeavoured to keep myself unfrozen by going at a hop, skip and a jump gait and whistling the tune of "Fire in the Mountains!" as I went along in three double quick time. Well, after I had walked about twenty-five miles up to the peak of Daybreak Hill, I soon discovered what was the matter. The earth had actually frozen fast in its axis and couldn't turn around; the sun had gotten jammed between two cakes of ice under the cogwheels, and there it had been shining and working to get loose until it had frozen fast in its sweat.

"C-r-e-a-t-i-o-n !" I thought. "Something must be done, or we're all done for !"

I took a fresh twenty pound bear off of my back that I'd picked up on the road and beat the animal against the ice until the hot oil began to work out of him on all sides. I then took and held him over the earth's axis, gave the earth's cog-wheel one kick backward till I got the sun loose, and in about 15 seconds the earth began to grunt and the sun arose and saluted me with such a wind of gratitude that it made me sneeze. I shouldered my bear and walked home introducing people to fresh daylight with a piece of sunrise in my pocket.

INSTRUCTIONS FOR REVISION SESSION

During our last double period you wrote your first draft of a yarn.

Today, I'd like you and your partner to take turns reading and discussing what each of you wrote during the last double period.

Discuss any points that aren't clear in your writings and think of ways to improve your yarn. For example, you might look to see whether your exaggerations could really happen or whether they are really exaggerations

When you are writing today, you should also remember that you are writing the final draft of your yarn so be sure that you have examined it closely for spelling, punctuation and grammar.

When you have finished your yarn, put your name on it and place (it/a copy of it) on my desk.

NOTE: If students ask for opinions on their writing, ask them to ask their partners. Refer them to dictionaries/checkers for spelling.

STUDENTS WHO FINISH EARLY MAY SELECT SOMETHING TO READ.

INTRODUCTION/VERBAL DIRECTIONS FOR SECOND FORM

COMPUTER WRITING PROGRAM

We've been doing a lot of work on yarns.

Who can tell me what a yarn is?

(Wait for student response. If no response, give the definition below.)

That's right. A yarn is basically a story which is a whole series of exaggerations.

Remember the Paul Bunyan story that we looked at that was an example of a yarn. Can anyone remember one of the exaggerations in it?

> (NOTE: The story is written below for reference. It is not to be written on the board.)

The bunkhouses where we slept were so cold that the words froze as soon as the men spoke. The frozen words were thrown in a pile behind the stove and the men would have to wait until the words thawed out before they knew what was being said.)

(Get at least one student response. (If one is not forthcoming, give an example.)

(HAND OUT COPY OF Yarn.) I'm giving you another example of a yarn. You can follow while I read along. (READ YARN ALOUD WITH LOTS OF EXPRESSION TO CONVEY EXAGGERATION.)

Now what I would like you to do is to write another yarn. We'll do a draft today and you can revise your draft in our next double period. It should be a story and not a poem or song.

You can brainstorm for ideas with your partner.

Remember that if you have trouble with some of the words, you can use the **(checker/dictionary)** to help you.

Please remember to write your name on your draft and put (it/a copy of it up here on my desk.

NOTE If students ask for opinions on their writing, ask them to ask their partners. Refer them to dictionaries/checkers for spelling.

STUDENTS WHO FINISH EARLY MAY SELECT SOMETHING TO READ.

Form B

HIGH WINDS

"One day when we were on the roundup," begins Johnny, "a heck of a wind started to blow. I knew it was going to a humdinger, so I picked out the biggest beef I could find and slung it back of my saddle to hold down the horse and keep us from being blowed away. The other boys saw what I was doing and they did the same. The wind blew so cold, and so hard, and so long, that all of us got pneumonia, and all of them other fellers kicked off till I was left alone.

"The wind blew for days, but me and the horse and that beef stuck together. Barns, houses, chickens, fences, and all kinds of things kept blowing past us; but the funniest thing of all was an old feller a-settin' in a rockin'chair, sailing along through the air. As he came nigh me, he yelled for a match to light his pipe. By the time I'd dug through three inches of dirt in my jeans, he was out of sight. Pretty soon a telephone came blowing by, so I grabbed it and told the operator in the next township that an old feller in a rocking chair was heading that way and would she see to it that somebody had a light ready for his pipe.

"The storm finally blew itself out, so I dumped off the steer and rounded up the 10,000 head of cattle that had drifted for more'n a 100 miles! When I got'em home to the ranch, I saw a big hat lying on the ground, so I picked it up. Under it was my old friend still in his rocking chair and puffing away at his pipe. 'Ah,' I said, 'so you got a match!'

"'Oh, no,' he said, 'but I got her going just the same. They gave me one of them new-fangled cigarette lighters. It lights my pipe fine, but it ain't so good for pickin' my teeth!"

INSTRUCTIONS FOR REVISION SESSION

During our last double period you wrote your first draft of a yarn.

Today, I'd like you and your partner to take turns reading and discussing what each of you wrote during the last double period.

Discuss any points that aren't clear in your writings and think of ways to improve your yarn. For example, you might look to see whether your exaggerations could really happen or whether they are really exaggerations.

When you are writing today, you should also remember that you are writing the final draft of your yarn so be sure that you have examined it closely for spelling, punctuation and grammar.

When you have finished your yarn, put your name on it and place (it/a copy of it) on my desk.

NOTE: If students ask for opinions on their writing, ask them to ask their partners. Refer them to dictionaries/checkers for spelling.

STUDENTS WHO FINISH EARLY MAY SELECT SOMETHING TO READ

Appendix D

Sample Student Papers

Paper A

General Competence	6
Focus/Oganization	6
Support	6
Mechanics	6

Yarn

It was a chilly April marnin', when I felt like havin somethin different for breakfast so I made meself a cheese sandwich with lots and lots of pepper. 'As I was eating it, some of the pepper got sucked up in me nose and I felt a wonerful sneeze comin' on.

I ran outside of the house as fast as me legs could carry me, cause I didn't want to get the house dirty from the spray. Outside d'ere were little children playing, so to keep anyone from gettin' hurt, I let the sneeze go right up into the sky.

It just so happened that the sun was passin' right over me when I let the sneeze go and it blew out the sun. Well I got pretty worried, cause I needed the sun to make me cherry trees grow and if I didn't get some cherries before I went to bed, I'd get me upset stomach and need to drink six bottles of Pepto bismal before it went away.

So I laid it upon meself to relight the sun before me cherry trees got sick. As I was searchin' for a big match I saw one of 'dose Olympic runners with a tarch in his hand. I walked over to the guy and he was a might weezing from runnin' all over Canada, so I bopped him on the 'ed and took his tarch.

Then I sprinted a mile and jumped to the sun. It was all cold and the wick was frozen, so it took about a month to warm the wick up, but when I did the Earth thanked me cause it was startin' to lose its tan.

Paper B

General Competence	5
Focus/Oganization	4
Support	4
Mechanics	4

The Big Race

It was the day of the big race. I was lined up at the start of the race, On Your Mark Get Set ...BANG. We were off.I could the feel the wind against my hair and I ran faster,faster and faster. I felt like I was running on air,my hair was in a vertical position and my eyes started to water. Then it happened ,I looked down and I saw the race beneath me.I ran and ran ,further and further. I saw the stars pass by me.

I stared straight ahead the earth was infront of me,then it came to me ,I was running around the world.Then I started dropping faster and faster.I could feel the gravity pull me through the atmosphere getting closer to the ground by the second. I started to see the race then I hit the ground.I looked behind me and saw all the other contestants,they were still behind me, running their fastest. I had won the race!Everyone crowded me and said that I ran so fast that I was just a blur in their eyes.Thats when I said,
"I felt like I ran around the world"and I claimed my trophy.

Paper C

General Competence	4
Focus/Oganization	3
Support	4
Mechanics	3

Tasmanian Devil

I went down to the stables to see the horses,it was so cold that when I tried to run my legs would stiffen and I'd fall to the ground.I could barely hop the fence around the horses.There standing by an apple tree was my favourite horse staring at me.

All of a sudden a crash came thundering down the hills the horse gave a shriek and ran around.There rolling down the hill was tasmanian devil wildly destroying everything in sight.I was in shock.My facourite horse came from hiding and made her way next to me staring at the devil.It came closer and closer not stopping.

It stopped when it ran into the fence.The tasmanian devil was disgusting drooling and growling.The other horses were going wild.A dog came barking fiercely,but stopped when it saw the ugly thing.I new if I ran it would come after me even though I was a fast runner.

It took it's time getting under the fence still drooling,suddenly it turned into a ball and started towards me.I jumped out of the way.You could tell it wasn't that hungary.It stared at me and did it again.

By this time it was serious,it backed up and rolled so fast I couldn't tell where it was.Suddenly the horse stepped in front of me and kicked the tasmanian devil out of sight.As the devil flew it wined.

I was very relieved.Every since that I'd been coming down to the stables to see her.All the other horses praised her.

Paper D

General Competence	3
Focus/Oganization	2
Support	3
Mechanics	3

SPAGETTI GALOR

It was June 1st, me and my family had just arrived at my favorite spagetti place ready for another delicous meal. We walked in and the first thing I noticed was a man sitting at the table next to where we were going to sit. It wasn't that he was a funny looking man, actually he wasn't funny looking at all but there was something funny about him I just wish I knew what! My family all assembled at our favorite table and we all ordered the Super Duper Grand Dulux Spagetti Dinner.

Our meals had arrived and we where all just about done when I again glanced over to see that same man was still sitting at the table still eating the same dish of food. My dad payed for our meal and we all got up and left. Just before I passed the table where that man was sitting I remembered that I left my glasses in the napken on my table, so I told my parents that I would be right out I hust had to go and retrieve my glasses. I walked back to my table and picked up my glasses then turned around and headed towards the exit. I was looking out the door hoping to see my parents sitting in the car right out the front door so that I wouldn't have to walk to much in the cold but just as I saw the head lights of a car I saw ground. Quickly I sat up and looked at the ground to se what I had tripped over when I heard "you big dumbo!" How dumb I felt! That's when I remembered where I had seen that man before, he was the man who had created the longest piece of spagetti, and I had just destroyed the longest piece of spagetti ever made!

Paper E

General Competence	2
Focus/Oganization	2
Support	2
Mechanics	2

THE HOT TUB

One day after my workout at the hot tub I went to the gym and met a guy he seemed very friendly so we went and relaxed by lifting some weights. We started thinking about our social life and then I asked him out for breakfast that night.

We met each other at the most expensive diner in town. Nether of us offered to pay so we decided to charge with money. We stood up at our table and payed for the dinner and ordered the cheapest champagne in the house.

We both drank our food and ate our wine until we were hungry. We ended up leaving late, before we suspected to. I told him that I had someone else in mind but that I had fun last night and will remember this night for the rest of his life

Paper F

General Competence	1
Focus/Oganization	1
Support	2
Mechanics	2

The War

There was a war in northern Canada it was on the border of Ontario and Quebec. The date was two days before Christmas it was cold and stormy. One gust of wind went by and the beautiful white fence blew away. The snow that was on the ground was not there so it was green everywhere the Ottawa river was frozen over all the building were flying through the air. In Quebec city citelles blew there mascot away.

The tanks of the Ontario's army hit sixty-seven people unconcis. The Mascot of the Quebec army killed two thousand people. The Old Fort Henryes canons blew to the parlament Buildings knoked into the Peace Towe. The Prime Minister came out and said" I'm talking to Ronald Ragan about the free trade agreement.

The war was over.

Appendix E

Table 6

On and Off Computer Mean Scores for Draft and Final Versions of Papers

	Draft version		Final version	
Scale	on computer	off computer	on computer	off computer
Competence	3.35	3.03	3.52	3.07
Focus	3.22	3.09	3.26	3.02
Support	3.22	2.95	3.30	3.10
Mechanics	3.14	2.79	3.49	2.99

Table 7

Means for Words per T-unit and Clauses per T-unit

	Mean words per T-unit		Mean clauses per T-unit	
Version	On computer	Off computer	On computer	Off computer
Draft	10.768	11.137	1.732	1.743
Final	10.907	11.021	1.755	1.708

Table 8

Mean paragraphing per hundred words

Version	On computer	Off computer
Draft	1.1615	1.461
Final	1.603	1.992

Table 9

Means for punctuation per T-unit and per cent incorrect punctuation

	Mean punctuation per T-unit		Mean % incorrect punctuation per T-unit	
Version	On computer	Off computer	On computer	Off computer
Draft	.990	.986	.125	.122
Final	1.017	1.052	.122	.126